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ORIGINAL RESEARCH

Serum glucose level of healthy adolescents within Bukuru metropolis, Jos South Local Government Area, Plateau State, Nigeria

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Purpose: This study was designed to determine the blood glucose level of healthy adolescents living in the southern region of Plateau State in northern Nigeria.

Design: The study screened apparently healthy adolescents to identify individuals at high risk of developing diabetes mellitus.

Methods and materials: Individuals who were confirmed healthy and not on any form of medication were enrolled in the study after the administration of a questionnaire which ruled out any form of aliment such as fever, gastroenteritis, and malaria. The serum glucose level was quantified using the glucose oxidase reagent. Data generated were analyzed using Excel 2007 (Microsoft®, Redmond, WA) and Student's *t*-test for an established normal range.

Results: The age distribution showed that those aged 14–16 years had a mean serum glucose level of 4.8 ± 1.11 mmol/L, while in those aged 17–19 years it was 4.9 ± 1.115 mmol/L, with a standard error of the mean of 0.17 and 0.15, respectively. The mean glucose level, weight, and height of the enrollees were 4.8 ± 1.12 mmol/L, 56.6 ± 6.20 kg, and 1.6 ± 0.009 m, respectively. The mean serum glucose of those from the Berom tribe and other tribes was 4.9 ± 1.21 mmol/L and 4.8 ± 1.15 mmol/L, respectively. Analysis of the mean glucose level with respect to sex, age, tribe, weight, and height of the established normal mean resulted in a P value of <0.05, which was not significant.

Conclusion: There was no significant difference in the serum glucose level of enrolled subjects. It was also observed that there was no significant difference between the glucose level based on the different tribes, sex, weight, and height of all enrolled subjects. Since glucose is involved with various body metabolic processes and is also an analyte of interest in diabetes mellitus, screening of adolescents would reduce the incidence of the disease.

Keywords: Blood glucose, adolescents, diabetes mellitus

Introduction

Diabetes mellitus is a metabolic disorder characterized by abnormally high blood glucose concentration. The disorder has been known for several thousand years and can be hereditary. It results either from deficiency in the production of insulin by the pancreas (type 1) or ineffectiveness of the insulin produced (type 2). The hyperglycemia experienced by diabetics results in damage to various organs in the body such as the kidneys, heart, and nerves.[2] The disorder also presents with other clinical features such as chronic mucocutaneous fungal infections, fetal macrosomia, congenital defects, and fetal loss due to repeated midtrimester abortions and stillbirth. Diabetes mellitus occurs throughout the world, with prevalence varying across regions.[3] In Nigeria, Ohwovoriole et al have reported a prevalence rate of 1.6% in males and 1.9% in females.[4]

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Current data indicate that the prevalence of diabetes mellitus worldwide will rise to about 300 million by 2025. In Nigeria, the expected rise is to about 1,658,000 by the year 2025.[5] In light of these statistics, it is necessary to carry out more screening and education about the importance of blood glucose monitoring.

Diabetes mellitus is a disorder that has both short- and long-term effects on both individuals and the economy. Nigeria is posed with the challenge of diabetes mellitus and its management in this global era. Thus, the aim of this work was (1) to help in the early diagnosis of individuals with diabetes mellitus and initiate early medical intervention and (2) to determine the blood glucose levels of adolescents in the Bukuru metropolis, with its unique environmental features.

Methods and materials

Sample

This study was conducted on 100 adolescents within the age range of 14 to 19 years attending selected secondary schools within the Bukuru metropolis in Jos South Local Government Area, Plateau State, Nigeria. Bukuru lies at latitude 9° 54′ N and longitude 8° 53′ E, covers an area of about 50 km^2, and is situated less than 300 km from Abuja, the federal capital of Nigeria. Because of its altitude, Jos experiences lower temperatures than the other states in Nigeria. The staple food of the community is basically carbohydrates in the form of cornmeal, acha (a type of local cereal), and rice. The subjects were enrolled in the study after satisfying the recruitment criteria, which were:

1. Within the age range of 14–19 years old
2. Had no evidence of ill health and were not on any form of medication.

Questionnaires were distributed to all who volunteered for the study and all subjects signed consent forms. Some information, such as tribe, height, and weight, was obtained from the subjects before blood collection.

Sample collection

Blood samples were collected from fasting subjects between 8 am and 9 am using the standard operating procedure for blood collection. About 5 mL of blood was collected from the antecubital vein of each subject into a 10 mL chemically clean plain tube. The blood samples were then allowed to clot for 30 minutes.

Sample analysis

Serum was obtained and analyzed for glucose concentration at the Department of Chemical Pathology, Jos University Teaching Hospital, Plateau State, Nigeria. The Corning mode 252 spectrophotometer courtesy of Corning Medical Limited (Staffordshire, UK) was use for this research.

Glucose concentration was estimated using the Trinder glucose activity test as modified by Boehringer in 1974.[6] The reagent used was of standard quality prepared by Randox Laboratories (Crumlin, UK), which is based on the principle that the glucose oxidase enzyme promotes oxidation of glucose to glucuronic acid with the production of equivalent amounts of hydrogen peroxide. In the presence of a second enzyme, peroxidase, oxygen from the peroxide was transferred to a suitable acceptor (4-aminophenazone), producing a colored product proportional to the concentration of glucose in the sample. The glucose concentration was then measured spectrophotometrically at 510 nm.

Blood glucose was calculated using the following formula:

$$\text{Glucose (mmol/L)} = \frac{\text{Test}-\text{Blank}}{\text{Standard}-\text{Blank}} \times \text{concentration of standard}$$

Normal values for glucose: 3.9–5.6 mmol/L.

Statistical analysis

Data obtained were analyzed using Student's *t*-test and Microsoft® Excel 2007 (Microsoft, Redmond, WA). The mean and standard deviation were calculated for normally distributed variables, with a P value of <0.05 considered not significant.

Results

Of the 100 enrolled subjects, 56 were of the Berom tribe, while 44 were of other tribes (Ibo, Yoruba, Tarok, Ngas, Mwagavul, Kwala, Fulani, and Ron/Kulere). The mean height and weight of subjects was 1.6 ± 0.09 m and 56.6 ± 6.20 kg, respectively, while the mean glucose level of subjects was 4.8 ± 1.12 mmol/L. Of the subjects, 35 were male and 65 were female, with a mean glucose level of 4.8 ± 1.18 and 4.9 ± 1.09 mmol/L, respectively. Forty-one subjects were aged 14–16 years and 59 subjects were aged 17–19 years. The mean glucose level, standard deviation, and standard error of the mean was 4.8 ± 1.11 mmol/L, 0.17 for those aged 14–16 years and 4.9 ± 1.15, 0.15 for those aged 17–19 years. Analysis of the mean glucose level with respect to sex, age, tribe, weight, and height of the established normal mean resulted in a P value of <0.05, which was not significant.

Discussion

One general observation from this study is that the mean glucose value for the whole study population was 4.8 mmol/L, which is in line with the established range of 3.9–5.8 mmol/L for adults.[7] There was no significant difference in the glucose level of males compared with females, although females had a higher statistically insignificant value. In 1999, Jaako reported that female adolescents had a higher fasting glucose level when compared with adolescent men, which he attributed to dietary changes in children.[8] Results from the present study suggest that the climate of Jos South did not affect the glucose level of the subjects, which is in agreement with Karvonen et al, who, in 2000 reported that climatic difference had no effect on glucose level of children.[9] The mean height and weight of the subjects were within the normal range for this age group and their blood glucose levels were also within the established normal range. This is in line with Urkiza et al's conclusion that some anthropometric factors, such as height and weight, are risk factors for raised blood glucose level.[10] The present study also indicates that the glucose level in early adolescence is not significantly different from that of older adolescents. It was also observed that the glucose levels did not differ significantly across subjects from different tribal groups, suggesting that tribal affiliation has no effect on glucose metabolism or on its level in the blood.

Disclosure

The authors declare no conflicts of interest.

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